Watershed: **Mokelumne River**

Years Sampled: **2007-2008, 2010, 2013-2014**

Study Objectives:

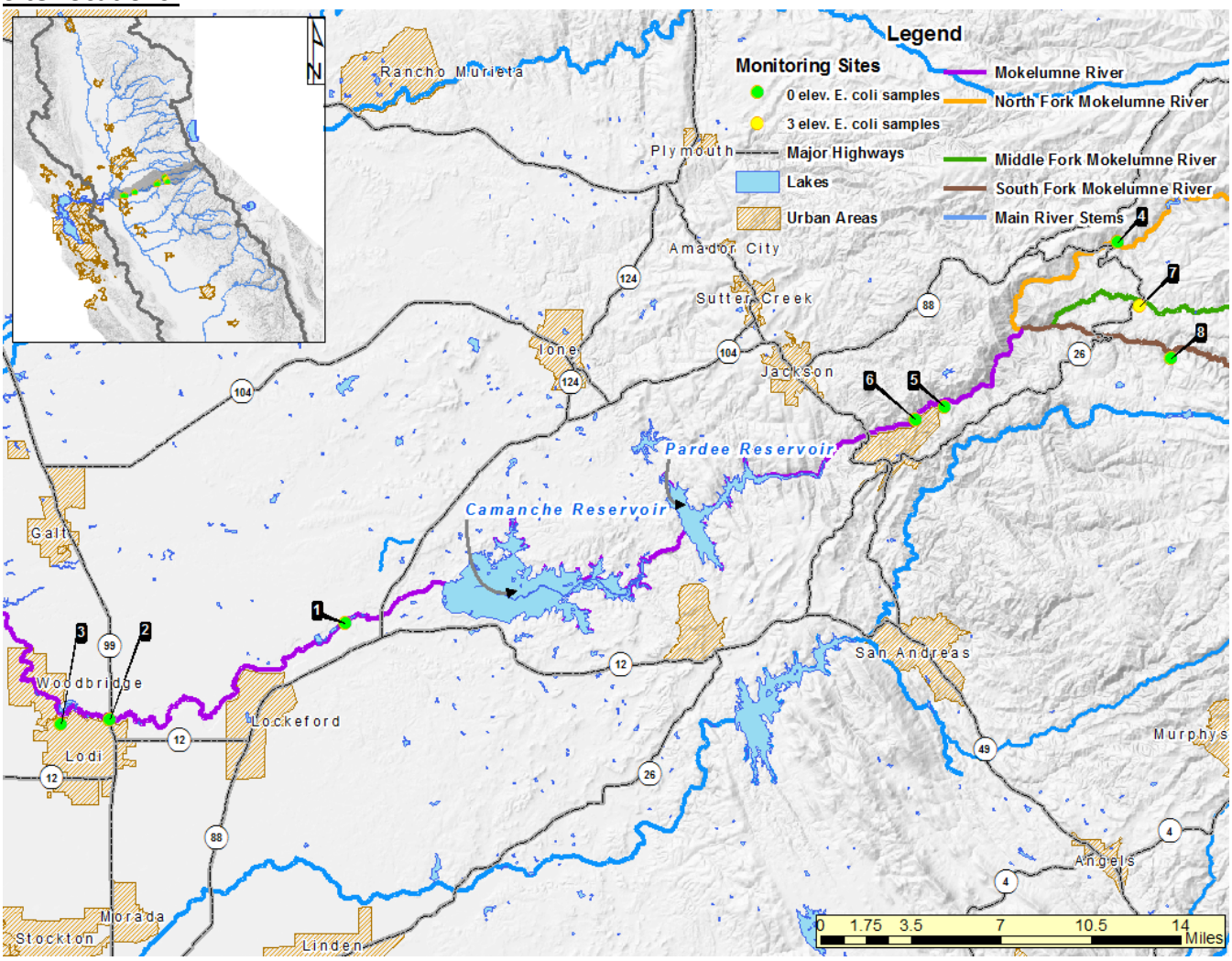
1. Is there any evidence that beneficial uses are being impacted, and if so, what are potential contributors?
2. Are there any noticeable regional, seasonal or trends observed in the water quality data?
3. What are pathogen concentrations at selected monitoring sites?

KEY STATISTICS

Number of sites sampled	**8**
Sampled by	***Water Board Staff (Sac)***
Number of sites sampled for pathogens	**0**
Number of total samples	**85**
Sampling Frequency	**2x/mo. (May-Sept.)**
Assessment Threshold	**320 MPN/100 mL**

Message: **One site has had three samples with elevated *E.coli.* Seven sites never exceeded the assessment threshold.**

Site Locations:



Summary of Results:

Table 1: Field Measurements

Station Code	Map #	Station Name	Oxygen, Dissolved (mg/L)		pH		SpConductivity (uS/cm)		Temperatiure (˚C)		Turbidity (NTU)	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
531SJC110	1	MR at Stillman Maggee Park	9.34	9.34	8.07	8.07	NR	NR	13.40	13.40	NR	NR
531SJC111	2	MR at Mokelumne Beach RV Park	8.43	8.43	8.68	8.68	41.5	41.5	18.30	18.30	NR	NR
531SJC112	3	MR at Lodi Lake	NR	NR	8.40	8.40	46.4	46.4	22.70	22.70	NR	NR
532AMA001	4	MR, N Fork at HWY-26	9.52	11.63	6.64	9.33	20.0	33.6	10.33	17.60	0.32	2.63
532AMA004	5	MR upstream of the Electra Powerhouse	7.62	8.92	7.28	8.40	54.8	56.8	22.30	26.50	NR	NR
532AMA005	6	MR downstream of Box Beach	9.48	10.86	6.56	9.13	23.0	29.9	16.30	20.10	NR	NR
532CAL009	7	MR, M Fork at HWY-26	7.74	9.82	6.77	8.68	51.0	97.5	11.09	21.10	0.84	15.50
532CAL010	8	MR, S Fork at Railroad Flat Bridge	7.62	9.79	7.18	7.78	47.8	105.0	11.15	20.30	0.26	2.83

MR; Mokelumne River, NR: Not Recorded

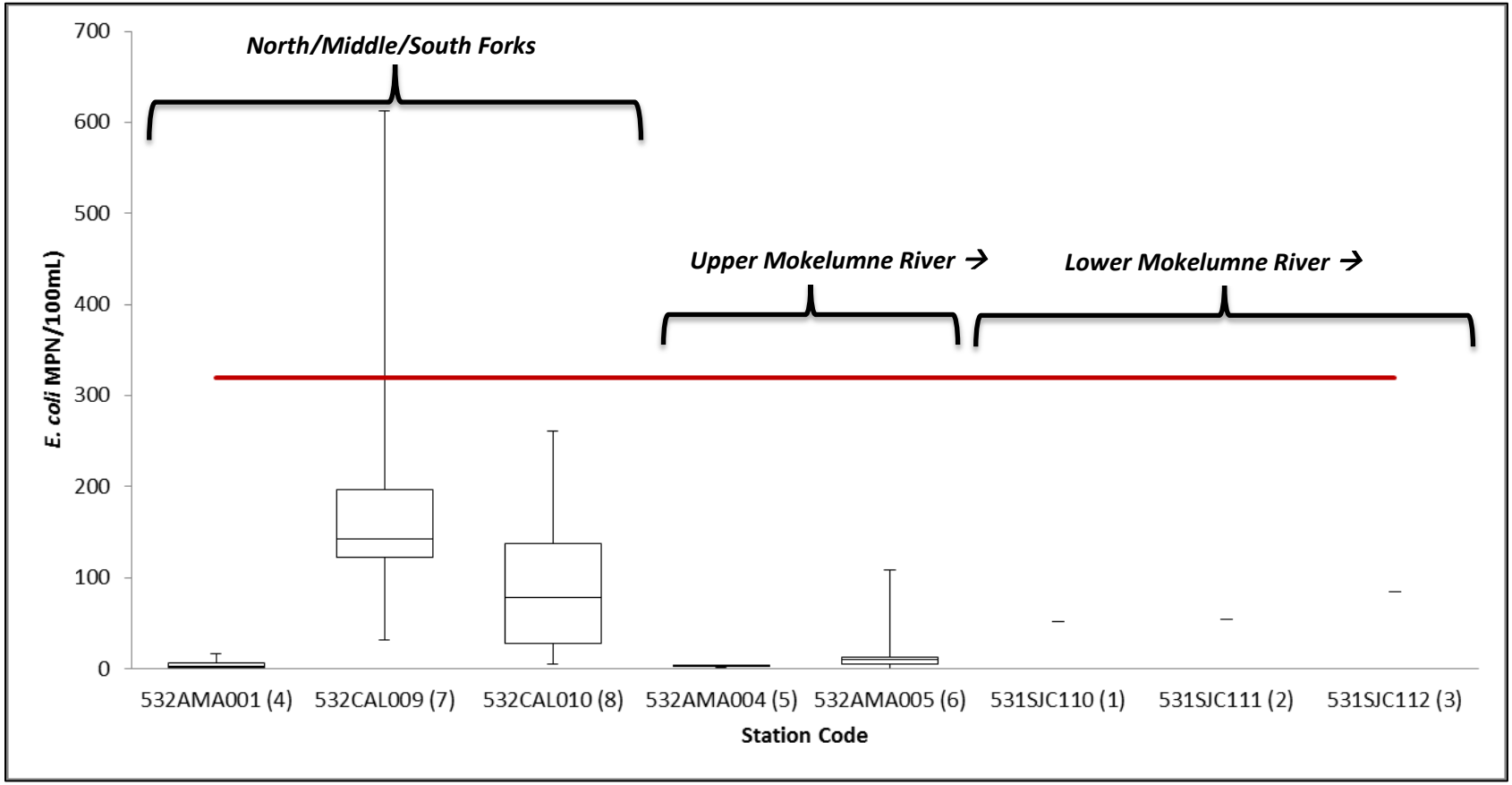
Table 2: *E. coli* and Pathogen Results

Map #	*E. coli* (MPN/100ml)					*Cryptosporidium* (cysts/L)			*Giardia* (oocysts/L)			*Salmonella* (MPN/100mL)			*E.Coli* O157:H7 (Presence/Absence)		
	Mean	Min	Max	Count	>320	Max Result	Count	(+)	Max Result	Count	(+)	Max Result	Count	(+)	Result	Count	(+)
1	52.0	52.0	52.0	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
2	54.4	54.4	54.4	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
3	84.5	84.5	84.5	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
4	4.3	<1.0	17.1	28	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
5	3.1	2.0	4.1	3	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
6	24.2	<1.0	108.1	6	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
7	185.7	31.3	613.1	24	3	NA	0	0	NA	0	0	NA	0	0	NA	0	0
8	95.7	5.2	261.3	21	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0

E.coli - Highlighted Cells: Exceeds EPA Guidline of 320 MPN/100ml

Pathogens - (+): positive result, Highlighted Cells: positive results, NA: Not Applicable

Graph 1: E Coli Results



4,7,8 = individual sites for each fork: north, middle, south; 5,6 = progressive DS flow along upper Mokelumne River;
1,2,3 = progressive DS flow along Mokelumne River (below Camanche Reservoir)

WHAT IS THE MEASURE SHOWING?

The Mokelumne River sampling sites are located in the central Sierran foothills east of Jackson and further west near the city of Lodi. The river originates from headwaters consisting of its North, Middle, and South Fork; these forks meet in the foothills and eventually empty into the Sacramento-San Joaquin River Delta. As the river breaks slope with the valley floor, it feeds the Pardee and Camanche Reservoirs. Sampling sites were chosen for each fork, and for river segments above and below the reservoirs. Field measurements for each site are shown in Table 1.

Results show that only 3 of 61 samples exhibited elevated levels of *E.coli*; they were located along the Middle Fork at Highway 26 with a maximum value of 613.1 MPN/100 mL (shown in Table 2). The percentage of contamination at the above sample locations is 3.5%; at the site specifically, this percentage is 12.5%. There were no detections along the North Fork, the South Fork, or the main stem (shown in Graph 1).

The watershed is primarily forest (Jin et al., 2013), yet potential non-point and urban sources are abundant. Parts of the watershed are heavily utilized for recreational activities, and it is home to numerous waterfowl and other wildlife.

No sites in the Mokelumne River watershed were sampled for pathogens.

WHY THIS INFORMATION IS IMPORTANT?

In 2012, the USEPA amended recreational water quality guidelines for human health under the Clean Water Act, specifying the standard threshold value (STV) for the indicator bacteria *E. coli* as 320 colony-forming units (CFU) per 100 milliliters (mL). The STV represents the 90% percentile of the water quality distribution, beyond which the water body is not recommended for recreation (Nappier & Tracy, 2012).

E. coli is an indicator of potential fecal contamination and risk of illness for those exposed to water (e.g. when swimming). Since *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern, the data collected from this study provide more information on pathogen indicators as well as specific water-borne pathogen concentrations to better assess their impact on the beneficial use of recreation and to identify potential contributors by sub watershed.

WHAT FACTORS INFLUENCE THE MEASURE?

E. coli and specific water-borne pathogens can come from human or animal waste and may be highly mobile and variable in flowing streams. In addition to human recreational use, the presence of pathogens in water may be the result of cattle grazing, wildlife, urban and agricultural runoff, or sewage spills. The physical condition of the watershed may also influence pathogen measurements, however in this study field measurements (temperature, SC, DO, turbidity and pH) were variable between sites and it is unclear if these constituents had an effect on the *E. coli* or pathogen measurements.

TECHNICAL CONSIDERATIONS:

- Data available at: CEDEN
- *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern.
- Public reports and fact sheets are available at: http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_water_ambient_monitoring/swamp_regionwide_activities/index.shtml

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Mokelumne River [Map]. 1:275000. RB5S GIS Data [computer files]. Rancho Cordova, CA. c2014 – [cited January 2015]. Using: ArcGIS [GIS software]. Version 10.2. Redlands, CA: ESRI Inc., 2013.

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Nappier, Sharon, Tracy Bone. 2012 Recreational Water Quality Criteria. Environmental Protection Agency [Internet]. Sacramento, CA. c2012 – [cited January 2015]. Available from: http://water.epa.gov/scitech/swguidance/standards/criteria/health/recreation/upload/factsheet2012.pdf